

Evolution & Origins of Life

1. Describe the contributions of Cuvier, Lyell, Malthus, Mendel and Wallace to Darwin's thoughts on Evolution. In other words, what were the clues that Darwin used to come to the concepts of evolution? What term did Darwin use for evolution?
2. What is a phylogenetic tree? How are these trees developed and what do they show?
3. Describe the mechanism of evolution (natural selection). What are the three observations/rules that led Darwin to his ideas about natural selection? What is artificial selection and how is it different from natural selection? How is it similar?
4. Describe the concept that Darwin called "Use and Disuse". What other name does it go by and who was the major proponent of this idea in Darwin's time? Is "Use and Disuse" a legitimate mechanism of heredity? Why or why not?
5. Describe the term adaptation. Give an example or two of an adaptation.
6. Compare and contrast the terms homology and analogy in terms of adaptations. What is molecular homology?
7. Define the following: population, gene pool, allele frequency and microevolution.
8. Define and give examples of directional selection, stabilizing selection, disruptive selection, balancing selection and sexual selection.
9. Describe how directional selection leads to antibiotic resistance. Why is it unreasonable to give antibiotics to a patient with a cold or flu? What is a "superbug"/ super-infection?
10. Describe how disruptive selection can lead to speciation. What is a species? Discuss speciation in the context of Darwin's finches. How is that different from, say, domestic dogs or cats.
11. Define and give examples of genetic drift (bottle neck, founder effect, inbreeding) and gene flow (immigration and emigration).
12. Define and give examples of mechanical, behavioral, temporal, ecological (geographical), gametic and post-zygotic isolation as mechanism of speciation.
13. Describe the three models of speciation: gradual, punctuated and adaptive radiation. Define extinction. What type of evidence do we have of extinct organisms? What are "extant" organisms?
14. What is a cladogram? Review what you learned about the six kingdoms and the three domains. Draw a diagram of these two systems of classification. Include a couple examples of organisms that are in each category.

Origins of Life

1. What is the age of the oldest rocks found on Earth? How do we know their age?

2. What was the Earth like for the first billion years? When does life show up in the fossil record? In other words, how old are the oldest fossils?
3. What were the first organisms like and when did they likely arise on Earth? Describe the atmosphere on Earth at that time. How did these cells get nutrients?
4. When did Oxygen start to exist in the atmosphere in large quantities? How did this occur (what organisms and what metabolic process is responsible for this)?
5. How and when did eukaryotic cells evolve? Describe the endosymbiont theory. List some of the evidence for the endosymbiont theory.
6. It may be helpful to draw yourself a timeline showing the age of the Earth (oldest rocks), the first fossils, when photosynthesis starts (approx), the first aerobic respiration, the appearance of eukaryotes, etc.